DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: **BP Yorktown Refinery**
Facility Address: **2201 Goodwin Neck Road, Grafton, Virginia 23692**
Facility EPA ID #: **VAD 05 099 0357**

1. Has all available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been considered in this EI determination?

X If yes - check here and continue with #2 below.
_____ If no - re-evaluate existing data, or
_____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EIs are near-term Objectives that are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY and does not consider potential future land- or groundwater-use conditions for ecological receptors. The RCRA Corrective Action Program's overall mission to protect human health and the environment requires that final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "contaminated" above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	**Rationale / Key Contaminants:**
Groundwater	**X**		**Benzene, toluene, MTBE, ethylbenzene, xylene, acetone, chromium, arsenic, lead, nickel, antimony, beryllium, molybdenum, thallium.**
Air (indoors) 2		X	**No indoor air pathway associated with SWMUS and AOC.**
Surface Soil (0-1 ft)	**X**		**Arsenic, benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene.**
Surface Water		X	**Carbon disulfide, toluene, ethylbenzene, xylene, phenols, MTBE, copper.**
Sediment	**X**		**Acetone, total PAHs, MTBE, benzo(a)pyrene, anthracene, copper.**
Sub-surface Soil (1-15 ft)	**X**		**Arsenic, benzo(a)pyrene, benzene, dibenz(a,h)anthracene.**
Air (outdoors)		X	No known or reasonably suspected impacts above risk based levels from SWMUs.

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk) and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Twelve SWMUs and one AOC on the refinery property have been investigated as part of the RCRA Facility Investigation (RFI) performed at the facility. The RFI was implemented in two phases (1994 and 1999). The second phase recommended additional work that was performed and reported in the Phase II RFI Addendum Report dated October 2001.

1. Site-wide groundwater monitoring was performed in both phases of the RFI. Quarterly groundwater monitoring for three of the SWMUs was begun in the 1980s for compliance with the Virginia Department of Environmental Quality Hazardous and Solid Waste program. The RFI data shows that chemicals are present above MCLs and EPA Region III tapwater RBCs in groundwater in specific portions of the site. The key contaminants found to be present above these levels are described in Sections 6 and 8 of the Final Phase II RFI Report and in Section 2 of the Phase II RFI Addendum Report dated October 2001 (EPA approved 2/21/02). See also Draft Corrective Measures Study (CMS) and Risk Assessment (RA) Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

2. No indoor air pathways are associated with the SWMUs subject to investigation during the RFI.

3. More than three hundred soil samples were collected and analyzed from the SWMUs and AOC as part of the RFI. RFI data indicates that soils in specific portions of the site are impacted above levels considered appropriate for onsite workers (refinery and construction workers). The key contaminants found to be present above risk-based levels are described in Sections 5 and 8 of the Final Phase II RFI Report dated October 2001 and in Section 1 of the Phase II RFI Addendum Report dated October 2001 (EPA approved 2/21/02). See also Draft CMS and RA Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

4. Samples of surface water and sediment were collected and analyzed as part of the second phase of the RFI. Locations included a surface water body (Bull Creek Pond) and tidal marsh located adjacent to the refinery on undeveloped property owned by BP. RFI data indicates that surface water and sediment is impacted in specific portions of Bull Creek Pond, the Tidal Marsh, and the Transition Area Tidal Pond above risk-based criteria for ecological receptors. The key contaminants found to be present above these levels are described in Sections 7 and 8 of the Final Phase II RFI Report dated October 2001.

5. Subsurface soils - see note #3 above - subsurface soil findings included in #3.

6. Based on known groundwater and soil/sediment concentrations, no outdoor air concentrations are known or reasonably expected to be above appropriate risk-based levels.

Footnotes:

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

2 Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there complete pathways between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential Human Receptors (under current conditions)				
Media	**Off-Site** Residential	**On-Site** Industrial Worker	**On-Site** Construction Worker	Trespasser	Recreational
Groundwater	YES	NO	YES	NO	NO
Surface Soil (0-1 ft)	NO	YES	YES	NO	NO
Surface Water	NO	NO	NO	YES	YES
Sediment	NO	NO	NO	YES	YES
Sub-surface Soil (1-15 ft)	NO	NO	YES	NO	NO

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific media including human receptors' spaces for media that are not potentially "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each potentially "contaminated" media - human receptor pathway.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6 and enter "YE" status code after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

X If yes (pathways are complete for any "contaminated" media - human receptor pathway) - continue after providing supporting explanation.

_____ If unknown (for any "contaminated" media - human receptor pathway) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

1. A complete pathway may exist for residents reportedly using private wells, however data collected during the RFI indicates that groundwater contaminant plumes detected at concentrations higher than risk-based screening criteria appear to be confined to the site. A complete pathway exists for onsite construction workers who may come into contact with shallow groundwater, however workers are required to control exposure using protective gear and following site-specific health and safety plan and facility safety procedures. Currently, groundwater is not used for any purpose at the refinery. See the Final Phase II RFI Report dated October 2001 and approved by EPA on 2/21/02.

2. A complete soil pathway exists for onsite workers (refinery and construction workers) who may be exposed to surface soil associated with several SWMUs that do not have controlled access, however workers are required to control exposure using protective gear and following site-specific health and safety plan and facility safety procedures. In addition, some of the SWMUs are permitted facilities where access is controlled and workers are limited to those who have appropriate 40-hour HAZWOPER training. See the Final Phase II RFI Report dated October 2001 and approved by EPA on 2/21/02.

3. A complete pathway for surface water and sediment may exist for trespassers on the undeveloped land adjacent to the operating refinery. A complete pathway may exist for potential recreational users (hunters, fishermen) in the areas of the York River, Bull Creek Pond, and the Tidal Marsh and Transition zones at the eastern edge of the Facility, however risk estimates calculated using RFI data show no unacceptable exposures are occurring. See the Final Phase II RFI Report dated October 2001 and approved by EPA on 2/21/02. See also Draft CMS and RA Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

4. A complete pathway for sub-surface soil may exist for onsite workers during excavation or construction activities however, workers are required to control exposure using protective gear and following site-specific health and safety plan and facility safety procedures. See the Final Phase II RFI Report dated October 2001.

4. Could exposure from any of the complete pathways identified in #3 be reasonably expected to be "significant" 3? (i.e. potentially "unacceptable" because exposures might be: 1) greater in magnitude, intensity, frequency and/or duration than assumed in the derivation of the acceptable "levels" used to identify the "contamination"; or 2) the combination of exposure magnitude and contaminant concentrations could result in greater than acceptable risks)

X If no (exposures can not be reasonably expected to be significant for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If yes (exposures could be reasonably expected to be "significant" for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

1. Exposures are not reasonably expected to be significant for the complete pathways identified in #3 based on the continued industrial operations at the site. Groundwater pathway for construction workers may be complete, but workers are required to control exposure using personal protective gear and following site-specific health and safety plan and facility safety procedures. Groundwater is not currently used for any purpose at the refinery, therefore resulting only in potential incidental exposure to construction workers. In addition, risk estimates calculated using RFI data show that all cancer risks from groundwater were acceptable for potential construction worker exposure. Groundwater pathway for residents may be complete, however RFI data indicates that groundwater impacts identified beneath the refinery are not migrating offsite in either the shallow or deep aquifer. Offsite well sampling completed during the RFI has not demonstrated groundwater impacts beyond the property boundary. In addition, offsite usage of groundwater for drinking or other purposes is limited and will be diminished as municipal water is provided throughout the Goodwin Neck Peninsula. Therefore, exposure via this pathway is not expected to be significant. See the Final Phase II RFI Report dated October 2001 and the Draft CMS and RA Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

2. Exposure to contaminated soils can occur, but is not expected to result in significant exposure. Risk estimates calculated using RFI data show that all cancer and noncancer risks were acceptable for all current receptors, with the exception of 3 specific portions of the site (SWMU 9, AOC 1, SWMU 2- eastern half). Any exposure to these areas by workers is not expected to be significant since workers are required to use personal protective gear and to follow the site-specific health and safety plan and facility safety procedures. Also, there is little current worker contact with or activities in SWMUs 9, 2, or AOC 1. See the Final Phase II RFI Report dated October 2001 and the Draft CMS and RA Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

3. Exposure to contaminated surface water and sediment can occur, but is not expected to result in significant exposure. Potential recreational use by hunters and fishermen is expected to be limited in frequency and duration in the areas of Bull Creek Pond, the York River, and Tidal Marsh. In addition, risk estimates calculated using RFI data show no unacceptable exposures are occurring. See the Final Phase II RFI Report dated October 2001 and the Draft CMS and RA Report, Appendix 2A-2B-2C-2D-2E-Risk Assessment dated October 3, 2001 and associated correspondence.

4. Exposure to contaminated subsurface soils in specific portions of the site can occur, but is not expected to result in significant exposure. Onsite workers are required to use personal protective gear and to follow the site-specific health and safety plan and facility safety procedures.

[3] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" exposures (identified in #4) be shown to be within acceptable limits?

___ If yes (all "significant" exposures have been shown to be within acceptable limits) -continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

___ If no (there are current exposures that can be reasonably expected to be "unacceptable") - continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

___ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):_____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below and attach appropriate supporting documentation as well as a map of the facility:

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **BP Yorktown Refinery** facility, EPA ID # **VAD 05 099 0357,** located at **2201 Goodwin Neck Road, Grafton, Virginia 23692** under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature)_____ Date: 09-25-02
(print) Donna M. McCartney
(title) Remedial Project Manager

Supervisor (signature)_____ Date: 09-25-02
(print) Robert E. Greaves
(title) Chief, General Operations Branch
EPA, Region 3

Locations where References may be found:

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.